

there is the experimental evidence; both strain-hardened metal and quenched steel on etching exhibit the well-defined oriented lustre of a crystalline aggregate, thus clearly showing that the crystals are not disarranged into minute irregular fragments. It would seem, therefore, that Mr. McCance's conclusions must be narrowed down to this, that the hardness of quenched steel is due to the same cause as the hardness of strain-hardened iron, and this—but for a difference as to mode of origin—is also the view of Edwards and Carpenter. In this narrowed conclusion, however, there is a distinct step forward, since we have a definite "explanation" of the hardening of steel in the sense that this phenomenon is correlated with the much larger class of phenomena which occur when any soft or ductile metal is hardened by plastic strain. If we accept the possible existence of the amorphous phase, it is easy to express both classes of facts in a single and simple formula, and this in itself constitutes another argument in support of the amorphous theory. Whatever view one may take of these admittedly hypothetical matters, it seems that a definite advance has at last been made in our knowledge of the hardening of metals.

W. ROSENHAIN.

SCHOOLS AND EMPLOYERS IN THE UNITED STATES.¹

MISS WINEFRID JEVONS gives in the report before us an interesting account of the history and present position of the relations between the schools and industrial employment in the United States.

The most important lesson to be learnt from the report is, perhaps, that in the United States employers and trade unions have realised, to a much greater extent than in this country, the necessity for part-time day classes for persons engaged in industry and commerce. Not only does the American Confederation of Labour take this view, but the National Association of Manufacturers also favours it. Indeed, the latter body went so far in 1912 as to recommend compulsory continuation classes, until the seventeenth or eighteenth year, one half-day a week, without loss of wages.

In this country there are some firms (comparatively few in number) who have had the wisdom to see that it is not only in the interest of the people they employ but also in their own interest to liberate young persons a certain number of hours a week, in order that they may in the daytime receive proper part-time instruction directed to make them more efficient in their respective industries; but we are still far from so wide and generous a belief in the value of education as the resolutions of the National Association of Manufacturers show to be prevalent in the United States.

The existence of such a wholesome state of public opinion accounts for the large amount of voluntary and compulsory part-time instruction which is to be found throughout the States; many instances of this are given in the report. In Massachusetts, a law has been enacted which enables local authorities to open day continuation classes for the education of children between fourteen and sixteen who are in regular employment, and to compel attendance at these classes in the daytime for not fewer than four hours a week; the time spent in the school is counted as a part of the number of hours that the child is permitted by law to work. The State provides half of the cost of the maintenance of the classes.

In the States of Ohio and Wisconsin, compulsory

day continuation classes are in existence; in the latter State, apprentices may not be employed for more than 55 hours a week, and the employer must liberate the apprentice five of these 55 hours a week in order that he may attend a day continuation school.

J. W.

SEISMOMETRY AND ENGINEERING.¹

IN the memoir before us we have a gratifying proof that practical engineers realise the importance of the application of the principles of instrumental seismometry to building construction. The immediate object in the present investigation is the vibration set up in a large masonry bounding wall of a reservoir in Queistal, Schleswig. This wall stretches between rocks across a narrow valley, and the overflow of water, estimated at 100 cubic metres a second, falls about 40 metres. Thus an enormous amount of vibrational energy is set up.

The destructive action of vibration on a structure is probably determined by the maximum acceleration experienced, and thus short-period vibrations are often more serious than long-period vibrations of larger amplitude. Prof. Grunmach first describes and discusses an apparatus designed to give the maximum acceleration, and then goes on to describe the arrangements for investigating the period and amplitude. These are really seismographs for measuring the horizontal and vertical components of motion. They are based on precisely the principle of electromagnetic registration introduced by Prince Galitzin for earthquake recording. The apparatus differs from Galitzin's in detail considerably, since the periods and amplitudes to be measured are very different from those experienced by the passage of earthquake waves. Continuous registration was made, and excellent diagrams of the results are given. It appears that the periods ranged from about 0.03 sec. to 0.003 sec., and the amplitude from 0.001 mm. to 0.00005 mm.

The theoretical discussion of electromagnetic registration given appears somewhat inadequate. The author adopts what may be called an equilibrium theory instead of a dynamical one. It is possible that this may be accurate enough in the case considered, but one would like a demonstration that this is so.

The memoir will no doubt be appreciated by engineers and seismologists alike.

G. W. W.

RECENT BOTANICAL WORK IN DENMARK.

AT the general meeting of the Danish Botanical Society in 1912 it was decided to publish in the future two distinct journals. One of these is the *Botanisk Tidsskrift*, the society's old periodical, which has reached its thirty-third volume, and contains chiefly papers on the Danish flora, besides articles on subjects of more general botanical interest. This will continue on its former lines, being written mostly in Danish, though occasionally—much too rarely, it may be said, for non-Danish readers—with abstracts in English, French, or German. The second journal is a new venture, the *Dansk Botanisk Arkiv*, published at indefinite periods, and containing monographs and other special articles in either of the four languages mentioned. Both journals are sent post free to members of the society, membership being open to all on payment of 10 kronen (11s.) a year; the subscription for the *Botanisk Tidsskrift* alone is 6 kronen, and the numbers of the *Arkiv* may be pur-

¹ Board of Education. Special Reports on Educational Subjects, vol. xxviii.

¹ "Experimentaluntersuchung zur Messung von Erdschütterungen. By Prof. L. Grunmach. Pp. 102. (Berlin: Leonhard Simion Nf., 1913.)

chased separately. We have received from the society copies of the 1913 numbers of the new journal, and some of those of the old one, besides two reprints from the *Mindeskript for Japetus Steenstrup*, published in 1913 and 1914.

These publications form sufficient testimony to the high standard of excellence maintained by the large output of papers by Danish botanists. The mantle of the distinguished veteran of Danish botany, Prof. Eugene Warming, has fallen upon the shoulders of C. Raunkiaer, who two years ago succeeded Warming as professor of botany in the University, and director of the Botanic Garden and Museum at Copenhagen, and who has already, like his predecessor, done brilliant work on the ecology of plants. In the 1913 *Tidsskrift*, Raunkiaer has a long paper on the plant ecology of the Skagen district, in which he applies his system of "life-forms" to the statistical study of the various plant communities. An account of Raunkiaer's methods of ecological study was given by Dr. W. G. Smith in the *Journal of Ecology*, vol. i., 1913, pp. 16-26, in which the value of Raunkiaer's system was pointed out. Ecology bulks largely in this, as in former volumes of the *Tidsskrift*, but while the Danish botanists have done so much for this department of the science they have by no means neglected other branches. Their systematic investigation of the flora of the Danish West Indies has yielded a large and valuable series of monographs, while they have done more detailed and intensive work on the vegetation of Denmark than has yet been carried out in any other area of similar extent, and the work of Ostenfeld, Borgesen, Paulsen, and others on the marine vegetation of the northern seas, and on the plankton in particular, is too well known to botanists generally to need more than passing mention here.

The first four parts of the new journal are occupied respectively by a list, in Danish with Latin diagnoses, of diatoms collected by Borgesen in the Danish West Indies; an account in English of the growth-forms of some plant formations of Swedish Lapland, by M. Vahl, who proposes a system of ecological nomenclature for plant formations according to the dominant growth-forms distinguished by Raunkiaer (a summary of Vahl's useful paper is given in *Journal of Ecology*, vol. i., pp. 304-6); a long paper in Danish on the ecology of lichens, with 240 illustrations, by O. Galloe, unfortunately without a summary in another language; and a valuable monograph of the marine algae (part i., Chlorophyceae) of the Danish West Indies, in English, and with a chart and 126 fine illustrations, by F. Borgesen. The last-named (*Bind i.*, No. 4, price 4 kronen) is of much more than merely systematic or algological importance, for Borgesen devotes 146 of his 158 pages to detailed descriptions of the Siphonaeae, a group of algae of peculiar morphological and biological interest, and exhibiting the extraordinary complexity of form and structure attained by plants which are built up of cenocytic or incompletely septate filaments.

With these four papers the *Dansk Botanisk Arkiv* has certainly made an excellent beginning, and the only criticism that occurs to an English botanist is that all papers written in Danish should be furnished with a generous summary in English or French or German. In this connection one may remark that despite all that has been written and said concerning the advisability of the use of one or other of the three most widely read languages in scientific literature, pending the arrival of the golden age of one universal speech, there is apparently an increasing rather than diminishing tendency for scientific workers in the smaller countries or those whose language is little

known outside their own frontiers, to publish in their own tongue.

There are, of course, many sides to this question, local patriotism and other considerations having to be taken into account, but it is certainly inconvenient and often exasperating to come across publications in languages such as Russian, Czech, the Scandinavian tongues, etc., with either the baldest summary, or in many cases none at all, in the more widely read languages. Life is too short for the acquisition of even a fair working knowledge of so many tongues; summaries or reviews in the familiar languages may or may not be published sooner or later in the *Centralblatt* journals, and are often very meagre indeed; and meanwhile one hesitates to take the thing to a translator—it may prove of no special importance for one's purpose after one has taken the trouble or expense involved. The remedy is simple enough: a scientific worker whose native language is not English, French, or German, should take the trouble to master one or other of these languages sufficient to be able to append a good summary to his paper. Failing this, a reversion to the old custom of publishing in Latin might be advocated.

The two reprints from the J. Steenstrup memorial volume are devoted to accounts of the species of *Sargassum* found on the coasts of the Danish West Indies, with remarks upon the floating forms of the Sargasso Sea, by Borgesen, in English; and of the distribution and reproduction of the common eel-grass or grass-wrack (*Zostera marina*) in Danish seas, by Petersen, in Danish.

F. C.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

BIRMINGHAM.—The war will have a serious effect upon the University during the coming session. The whole of the new buildings at Edgbaston have been taken over by the War Office, and now form the First Southern General Hospital. Certain structural alterations are being carried out with a view of making the hospital as efficient as possible. The size and situation of the buildings and grounds, and their proximity to railway and canal, render them especially suitable for the present purpose.

CAMBRIDGE.—Mr. W. L. Bragg, son of Prof. W. H. Bragg, has been elected to a fellowship at Trinity College. He gained first-class honours in the Natural Science Tripos, with distinction in physiology.

A SCHOOL of public health is to be established at the University of Minnesota.

DR. T. SHENNAN, pathologist to the Royal Infirmary of Edinburgh, has been appointed Regius professor of pathology in the University of Aberdeen, in the place of the late Prof. G. Dean.

THE new session of the medical faculty of the University of Manchester will be opened on October 8 by an address by Prof. E. S. Reynolds on the industrial diseases of Greater Manchester.

THE Bissett-Hawkins memorial medal of the Royal College of Physicians of London has been awarded to Sir Ronald Ross, for his work in connection with malaria, and the Sir Gilbert Blane medal of the Royal College of Surgeons of England has been awarded to Surgeon G. F. Syms, R.N.

It is announced in *Science* that Prof. C. H. Eigenmann has been appointed research professor of zoology in the Indiana University, and that he proposes to devote the greater part of the time at his disposal in completing his studies of the distribution of the fishes of western Ecuador and western Colombia and